CITY OF CLIFTON (PWS 6210002)
SOURCE WATER ASSESSMENT FINAL REPORT

January 15, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment areas and sensitivity factors associated with the well, the spring, and the aquifer characteristics.

This report, *Source Water Assessment for City of Clifton, Idaho*, describes the public water system (PWS), the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The City of Clifton PWS (# 6210002) is a community drinking water system located in Franklin County that includes a spring and a well. The spring is the system's primary source of water and is located approximately two miles from town in Clifton Canyon next to Clifton Creek Road. It was developed in 1915 and has been redeveloped since then. Another smaller developed spring is located approximately 1,000 feet above the main spring. However, it discharges directly to the creek. The well is located on the north side of town on Povey Road. It was originally constructed in 1955 to a depth of 202 feet below ground surface (bgs). Due to pumping sand at times, it was deepened to 352 feet bgs in 2000. It produces approximately 175 gallons per minute (gpm) with a drawdown of 10 feet. The water from the spring is gravity fed into a 100,000-gallon partially buried storage reservoir located on a hillside west of town. The well water is pumped directly into this storage reservoir. The water system serves approximately 312 persons through 84 connections.

The potential contaminant sources within the delineation capture zones of the spring and the well are Clifton Creek, Clifton Creek Road, a field north of the well, and a gravel road. If an accidental spill occurred into any of these corridors or areas, inorganic chemical (IOC) contaminants, volatile organic chemical (VOC) contaminants, synthetic organic chemical (SOC) contaminants, or microbial contaminants could be added to the aquifer systems. Additionally, a trailer manufacturing company and an underground storage tank (UST) were identified within the delineation capture zones of the well. If a spill or leak occurred at either of these locations, IOC contaminants, VOC contaminants, or SOC contaminants could be added to the aquifer systems. Also, the Clifton City water system operator reported that cattle are grazing above the spring in the Clifton City watershed, potentially adding IOC contaminants and microbial contaminants to the spring water.

Final susceptibility scores for the spring are derived from heavily weighting potential contaminant inventory/land use scores of the spring and adding them to the spring system construction score. The final susceptibility scores for the well are derived similarly from equally weighting potential contaminant inventory/land use scores and adding them to the hydrologic sensitivity and the system construction scores. Therefore, a low rating in one category coupled with a higher rating in the other category(ies) results in a final rating of low, moderate, or high susceptibility. Potential contaminants are divided into four categories: IOCs (i.e., nitrates, arsenic), VOCs (i.e., petroleum products), SOCs (i.e., pesticides), and microbial contaminants (i.e., bacteria). As a spring or a well can be subject to various contamination settings, separate scores are given for each type of contaminant.

For the assessment, a review of laboratory tests was conducted using the State Drinking Water Information System (SDWIS). The last detection of total coliform bacteria in the distribution system was recorded in August 1999. However, repeat detections of total coliform and E. coli bacteria occurred in 1999 and 2000 at the spring and spring box. No SOCs or VOCs have been detected in the water system. The IOCs fluoride and nitrate have been detected in the spring and the well water but at concentrations below the maximum contaminant level (MCL) for each chemical, as established by the EPA. Additionally, traces of alpha and beta particles (radionuclides) have been detected in the drinking water.

In terms of total susceptibility, the spring rated moderate for IOCs, low for VOCs and SOCs, and high for microbial contaminants due to the repeat bacteria detections at the spring and spring collection box. System construction rated moderate and potential contaminant land use scores were moderate for IOCs and low for VOCs, SOCs, and microbials. The cattle grazing within the watershed above the spring, the gravel road, and Clifton Creek contributed to the susceptibility of the spring to contamination.

The total susceptibility for the Clifton well was high for all potential contaminant categories. The 1995 Ground Water Under Direct Influence (GWUDI) survey shows that a farmer's field and a gravel road run within 50 feet of the well. The proximity of these potential contaminant sources resulted in automatic high susceptibility scores for the well. Hydrologic sensitivity and system construction rated moderate for the well and potential land use scores were moderate for IOCs and low for VOCs, SOCs, and microbials. If the farmer's field and the gravel road are removed or relocated outside the 50-foot sanitary setback, the overall susceptibility of the well would be reduced to moderate for IOCs, SOCs, and VOCs and low for microbial contaminants.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed drinking water protection program will incorporate many strategies. For the City of Clifton, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system's components and its capacity). The system should continue their efforts to keep the distribution system free of microbial contamination and concentrate on meeting well construction standards such as installing a downturned, screened vent on the wellhead. The City of Clifton may want to install a disinfection system at the spring to reduce the chance of bacterial contamination in the drinking water. Additionally, efforts should be made to work with local landowners and government agencies in protecting the watershed surrounding the spring and the well from contamination associated with activities such as cattle grazing, agricultural chemical use in the field near the well, and accidental spills associated with the corridors near the well and the spring. The hay that is grown in the fenced area around the spring should not have chemicals applied to it within 100 feet of the source. As land uses within most of the source water assessment areas are outside the direct jurisdiction of the City of Clifton, collaboration and partnerships with state and local agencies and industry groups should be established and are critical to success. Educating city employees and the public about source water will further assist the system in its monitoring and protection efforts

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include household hazardous waste disposal methods and the importance of water conservation. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Franklin County Soil Conservation and Water District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (e.g. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR CITY OF CLIFTON, IDAHO

Section 1. Introduction - Basis for Assessment

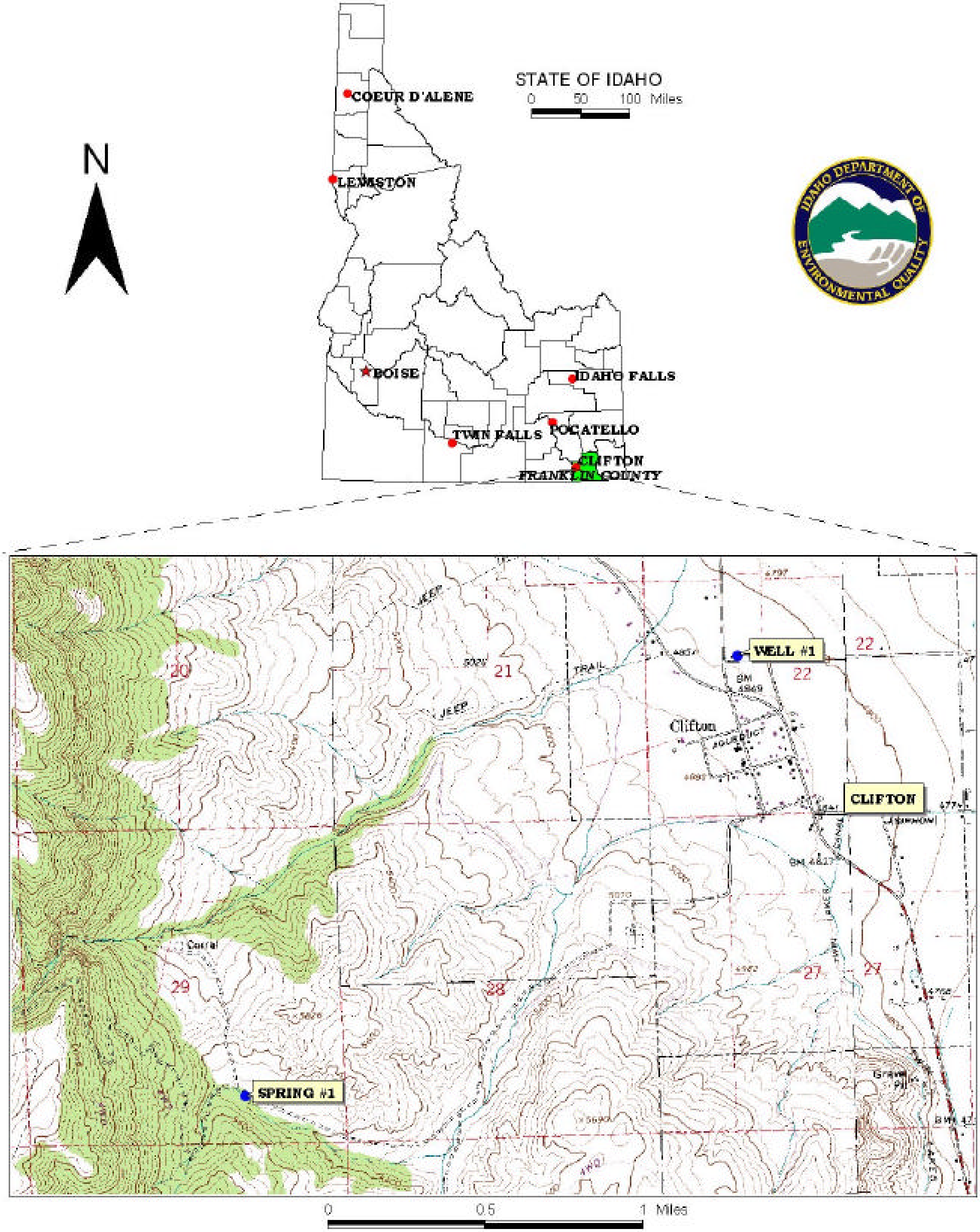
The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this assessment means.** Maps showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are included. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is included.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the well and the spring, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water supply system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the public water system (PWS).**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

FIGURE 1. Geographic Location of the City of Clifton



Section 2. Conducting the Assessment

General Description of the Source Water Quality

The City of Clifton PWS (# 6210002) is a community drinking water system located in Franklin County (Figure 1) that includes a spring and a well. The spring is the system's primary source of water and is located approximately two miles from town in Clifton Canyon next to Clifton Creek Road. It was developed in 1915 and has been redeveloped since then. Another smaller developed spring is located approximately 1,000 feet above the main spring. However, it discharges directly to the creek. The well is located on the north side of town on Povey Road. It was originally constructed in 1955 to a depth of 202 feet below ground surface (bgs). Due to pumping sand at times, it was deepened to 352 feet bgs in 2000. It produces approximately 175 gallons per minute (gpm) with a drawdown of 10 feet. The water from the spring is gravity fed into a 100,000-gallon partially buried storage reservoir located on a hillside west of town. The well water is pumped directly into this storage reservoir. The water system serves approximately 312 persons through 84 connections.

The last detection of total coliform bacteria in the distribution system was recorded in August 1999. However, total coliform and E. coli bacteria were detected repeatedly in the spring and spring box in 1999 and 2000. No SOCs or VOCs have been detected in the water system. The IOCs fluoride and nitrate have been detected in the spring and the well water but at concentrations below the MCL for each chemical, as established by the EPA. Additionally, traces of alpha and beta particles (radionuclides) have been detected in the drinking water.

Defining the Zones of Contribution – Delineation

The delineation process establishes the physical area around a spring or a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a flowing spring or well) for water in the aquifer. Washington Group International (WGI) was contracted by DEQ to define the PWS's zones of contribution. WGI used a calculated fixed radius model approved by the Source Water Assessment Plan (DEQ, 1999) in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT zones for water associated with the "None" hydrologic province in the vicinity of the City of Clifton. The computer model used site specific data, assimilated by WGI from a variety of sources including operator records and hydrogeologic reports. A summary of the hydrogeologic information from the WGI report is provided below.

Hydrogeologic Conceptual Model

Graham and Campbell (1981) identified and described 70 regional ground water systems throughout Idaho. Thirty-four of these fall within the southeastern part of the state. The "None" hydrologic province includes all the area outside of the 34 regional systems in southeast Idaho. The smaller and more localized aquifers in the "None" province typically are situated in the foothills and mountains that surround and recharge the regional ground water systems.

The mountains and valleys within the “None” hydrologic province were formed during two events separated by approximately 50 to 70 million years (Alt and Hyndman, 1989, pp. 329 and 336). The overthrust belt of the northern Rocky Mountains was formed roughly 70 to 90 million years ago through the intrusion of granitic magma and a massive eastward movement of large slabs of layered sedimentary rocks along faults that dip shallowly westward (Alt and Hyndman, 1989, p. 329). This movement caused extreme folding and fracturing of the sedimentary and granitic rocks and, in many cases, left older formations lying on top of younger ones. Later Basin and Range block faulting broke up the largely eroded Rocky Mountains into large uplifted and downthrown blocks resulting in the present day northwest trending mountains and valleys seen throughout southeast Idaho. Paleozoic and

Precambrian limestone, dolomite, sandstone, shale, siltstone, and quartzite are the predominant materials forming the mountains and probably compose the bedrock underlying the valleys between Salmon, Idaho on the north side of the Snake River Plain and Franklin, Idaho near the Utah/Idaho border (Dion, 1969, p.18; Kariya et al., 1994, p. 6; Bjorklund and McGreevy, 1971, p. 12; and Parliman, 1982, p. 9).

Ground water movement in the mountains is primarily through a system of solution channels, fractures and joints that commonly transmit water independently of surface topography (Bjorklund and McGreevy, 1971, p. 15; Dion, 1969, p. 18). Ralston and others (1979, pp. 128-129) state that the geologic structural features also can contribute to the development of cross-basin ground water flow systems. Ground water entering a geologic formation tends to follow the formation because hydraulic conductivities are greater parallel to the bedding planes than across them. Synclines and anticlines provide structural avenues for ground water flow under ridges from one valley to another.

The average annual precipitation in the mountains of southeast Idaho ranges from 20 inches on ridges near Soda Springs to over 45 inches on the Bear River Range (Ralston and Trihey, 1975, p. 7, and Dion, 1969, p. 11). The valleys receive an average of 7 to 10 inches annually (Donato, 1998, p. 3, and Dion, 1969, p. 11). Precipitation and seepage from streams are the primary source of recharge to the mountain aquifers (Kariya, et al., 1994, p. 18, and Parliman, 1982, p. 13).

Ground water discharge occurs as springs and seeps issuing from faults, fractures, and solution channels and as underflow to regional aquifers. The Bear River Basin in the far southeast corner of the state contains hundreds of springs issuing primarily from fractures and solution openings in the bedrock mountains (Dion, 1969, p. 47, and Bjorklund and McGreevy, 1971, pp. 34-35). Within Cache Valley many springs discharge from the valley-fill deposits (Kariya et al., 1994, p. 32).

There is little available information on the distribution of hydraulic head and the hydraulic properties of the aquifers in the “None” hydrologic province. No U.S. Geological Survey (2001) or Idaho Statewide Monitoring Network (Neely, 2001) wells are located in the areas of concern to provide information on ground water flow direction and hydraulic gradient or to aid in model calibration. The information that is available indicates that the hydraulic properties are quite variable, even within a specific rock type. Ralston and others (1979, p. 31), for example, present hydraulic conductivity estimates for fractured chert ranging from 2.2 to 75 feet per day (ft/day). Estimates for phosphatic shale are as low as 0.07 ft/day (unfractured) and as high as 25 ft/day (fractured).

Springs and Spring Delineation Methods

A spring is defined as a concentrated discharge of ground water appearing at the ground surface as flowing water (Todd, 1980). The discharge of a spring depends on the hydraulic conductivity of the aquifer, the area of contributing recharge to the aquifer, and the rate of aquifer recharge. PWS springs are generally perennial. Large seasonal changes in the discharge rates are an indication of a relatively shallow flow system. While most springs fluctuate in their rate of discharge, springs in volcanic rock (e.g., basalt) are noted for their nearly constant discharge (Todd, 1980).

Delineation of the drinking water protection area for a spring involves special consideration. Hydrogeologic setting is foremost among the factors that control the shape and extent of the capture zone. A spring resulting from the presence of a high permeability fracture extending to great depth will have a much different capture zone than a depression spring formed where the ground surface intersects the water table in a unconsolidated aquifer.

The refined, topographic, and calculated fixed-radius (IDEQ, 1997, p. 4-9), methods were used to delineate hydraulic capture zones for PWSs in the “None” hydrologic province and southeast Idaho springs. Method selection was based on an assessment of hydrogeologic uncertainty as affected by the quantity and quality of available information. A more detailed description of the delineation approaches is provided in the following sections.

Well Calculated Fixed-Radius Method

The fixed radii for the 3-, 6-, and 10-year capture zones were calculated using equations presented by Keely and Tsang (1983) for the velocity distribution surrounding a pumping well. This method was selected because the ground water flow systems in the mountains of southeast Idaho are typically very complex and poorly characterized. Ground water infiltrating into folded, faulted, and fractured bedrock formations may recharge shallow localized systems with short flow paths and residence times or it may enter deeper intermediate or regional systems with longer flow paths and residence times.

Unfortunately, there generally are no water level data with which to determine the flow direction and hydraulic gradient in the different aquifers. In the absence of water level data, the ground water flow direction and hydraulic gradient may differ greatly from one flow system to another, because of the existence of structural controls and heterogeneity.

The Clifton well is completed in a sand and gravel aquifer. The capture zone radii were calculated using a hydraulic conductivity of 17 ft/day, estimated from the analysis of specific capacity data from the driller's log using the method of Walton (1962, p. 12; pp. B-4 through B-7). The effective porosity and hydraulic gradient are the default values presented in Table F-3 of the Idaho Wellhead Protection Plan (IDEQ, 1997, p. F-6) for unconsolidated alluvium. The aquifer thickness is the total span from the top of the first perforated interval to the bottom of the deepest interval. The pumping rate is 1.5 times the average daily production rate.

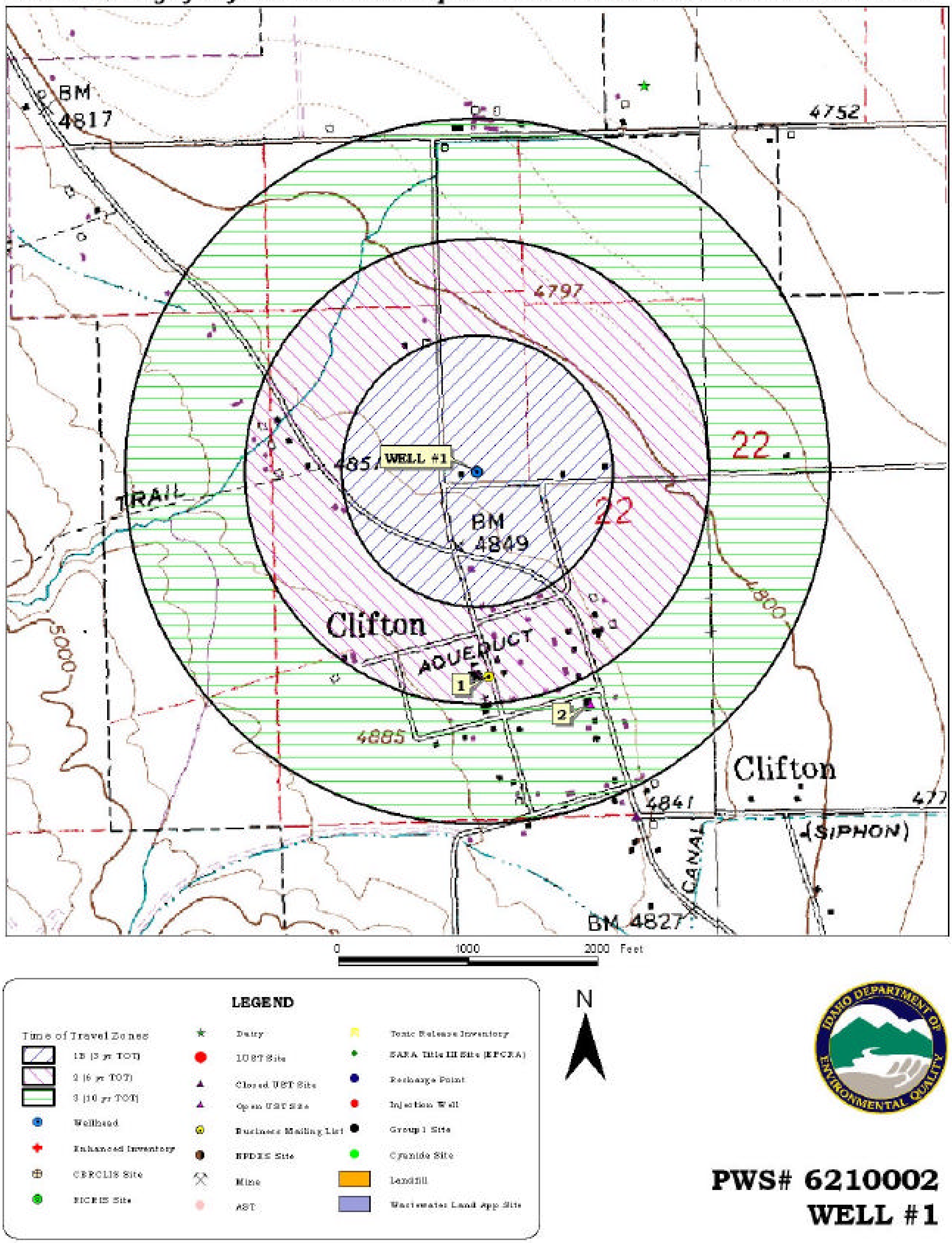
Spring Calculated Fixed-Radius Method

Application of the calculated fixed-radius method for delineating springs in southeast Idaho involves model-input determination and factor of safety determination. Model calibration and sensitivity do not apply to this method. A sensitivity analysis is not a necessary precursor to the factor of safety determination with the calculated fixed-radius method, in part, because determination of a flow direction factor of safety is unnecessary for a circular source area. A circular source area also makes consideration of uncertainty associated with capture zone width unnecessary.

The calculated fixed-radius method was used to determine the delineation for the Clifton Spring. The calculated fixed-radius method was used for delineating capture zones for PWS springs located in areas with a general lack of hydrogeologic data. The fixed radii for the 3-, 6-, and 10- year capture zones were calculated using equations presented by Keely and Tsang (1983) for the velocity distribution surrounding a pumping well. It is assumed that the majority of PWS springs issue from sedimentary rock, due to the prevalence of this material throughout the mountains of southern Idaho. For this reason, the hydrologic input used to calculate the time dependent radii are the default values presented in Table F-3 of the Idaho Wellhead Protection Plan for mixed volcanic and sedimentary rocks, primarily sedimentary rocks (IDEQ, 1997, p. F-6). An average discharge rate of 563,000 gallons per day (gal/day) was calculated for the PWS springs that have reliable discharge data and used to calculate the fixed-radii for springs with unknown discharge and for springs with a discharge equal to or less than the average rate. The resulting 3-, 6-, and 10-year capture zone radii of 462, 688, and 933 feet were rounded up to 500, 700, and 1,000 feet, respectively. To maintain conservatism, the actual discharge rates were used for springs with discharges greater than the average.

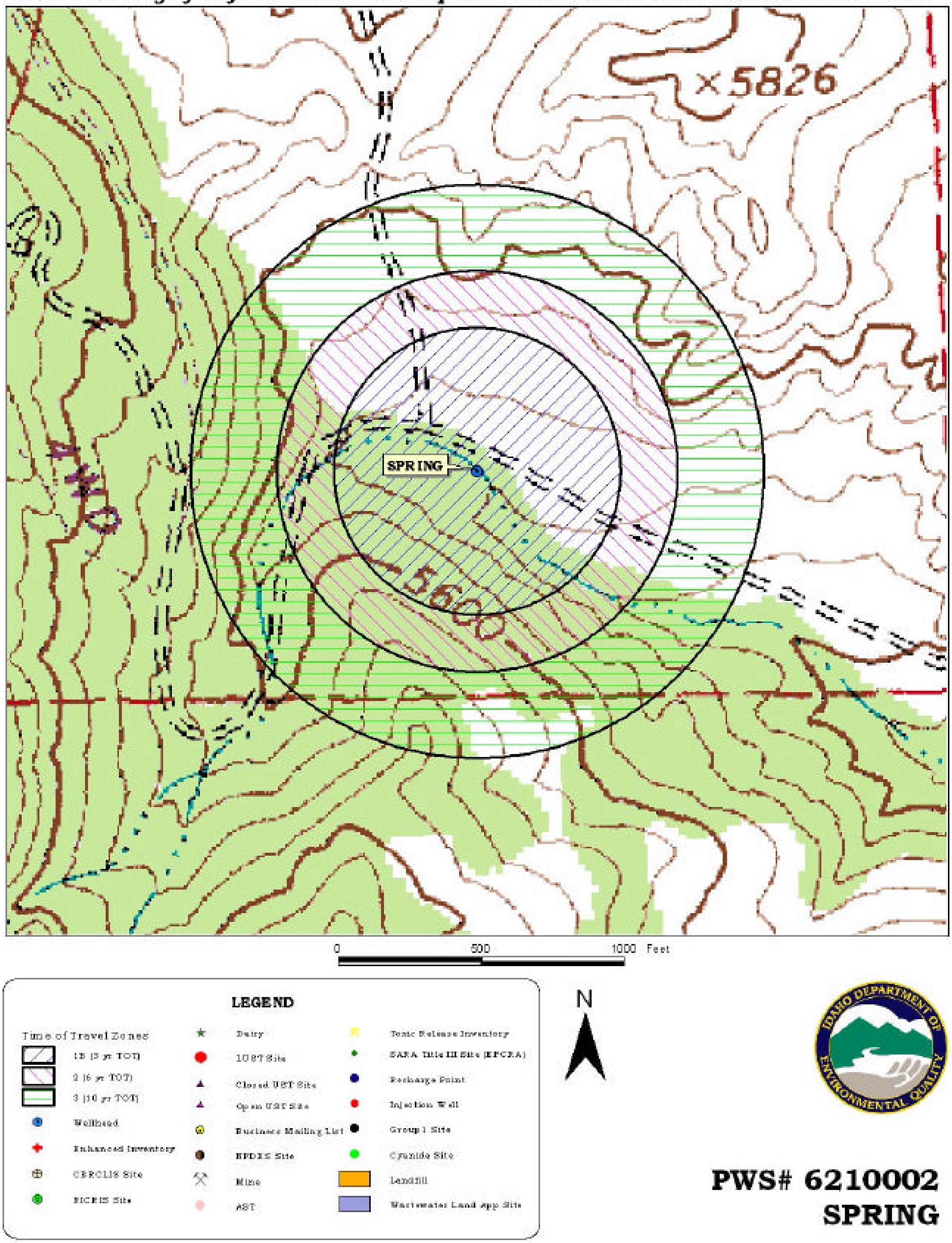
The delineated source water assessment area for the City of Clifton spring can be described as three concentric circles, 500 feet in diameter (3-year TOT), 700 feet in diameter (6-year TOT) and 1,000 feet in diameter (10 year TOT) (Figure 2). The delineated source water assessment area for the City of Clifton well can also be described as three concentric circles, 1,041 feet in diameter (3-year TOT), 1,780 feet in diameter (6-year TOT) and 2,706 feet in diameter (10 year TOT) (Figure 3). The actual data used by WGI in determining the source water assessment delineation area is available from DEQ upon request.

FIGURE 2. City of Clifton Delineation Map and Potential Contaminant Source Locations



PWS# 6210002
WELL #1

FIGURE 3. City of Clifton Delineation Map and Potential Contaminant Source Locations



PWS# 6210002
SPRING

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act. Furthermore, these sources have a sufficient likelihood of releasing such contaminants into the environment at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Field surveys conducted by DEQ and reviews of available databases identified Clifton Creek, Clifton Creek Road, a gravel road, a farmer's field, a UST, and a trailer manufacturer as potential contaminant sources within the delineated areas (Table 1 and Table 2, Figure 2 and Figure 3). The Clifton City water system operator also identified grazing cattle above the spring (Table 2).

It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. Many potential sources of contamination are regulated at the federal level, state level, or both, to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, including educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply source.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted in August and September 2002. The first phase involved identifying and documenting potential contaminant sources within the City of Clifton source water assessment area through the use of sanitary surveys, computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to identify and add any additional potential sources in the delineated areas. Maps with the spring location and the well location, delineated areas, and potential contaminant sources are provided with this report (Figure 2 and Figure 3, Table 1 and Table 2). At the time of the enhanced inventory, the City of Clifton operator, Russell Roberts, reported that cattle graze on land above the spring in the Clifton City watershed, potentially adding IOCs and microbials to the spring water. However, as a non-point source of contamination, this cattle grazing is not included on the maps but was assessed as a potential contaminant source in the delineation of the spring.

Table 1. City of Clifton Well, Potential Contaminant Inventory

Site #	Source Description[1]	TOT Zone (years)	Source of Information	Potential Contaminants[2]
	Farmer's Field	0-3	Sanitary Survey	IOC, SOC
1	Trailer Manufacturer	3-6	Database Search	IOC, VOC, SOC
2	UST-Open	6-10	Database Search	VOC, SOC
	Gravel Road	0-3, 3-6, 6-10	Sanitary Survey	IOC, VOC, SOC, Microbials

[1] UST = Underground Storage Tank

[2] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table 2. City of Clifton Spring, Potential Contaminant Inventory

Site #	Source Description	TOT Zone (years)	Source of Information	Potential Contaminants[1]
	Clifton Creek	0-3	GIS Map	IOC, VOC, SOC, Microbials
	Clifton Creek Road	0-3, 3-6, 6-10	GIS Map	IOC, VOC, SOC, Microbials
	Grazing Cattle	0-3, 3-6, 6-10	Enhanced Inventory	IOC, Microbials

[1] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Section 3. Susceptibility Analyses

The spring's susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: construction, land use characteristics, and potentially significant contaminant sources. The well's susceptibility to contamination was also ranked as high, moderate, or low risk according to the hydrologic sensitivity as well as system construction, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for the spring or the well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Attachment A contains the susceptibility analysis worksheets. The following summaries describe the rationale for the susceptibility ranking.

Well Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors. These factors are surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone (aquitard) above the producing zone of the well. Slowly draining soils such as silt and clay have better filtration capabilities and therefore are typically more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

Hydrologic sensitivity was rated moderate susceptibility for the Clifton well (Table 3). This is based upon moderate to well drained soil classes as defined by the National Resource Conservation Service (NRCS). Though the well log for the deepening of the well in 2000 was provided, the original well log was not available, reducing the ability to fully determine the composition of the vadose zone and the depth to first ground water. However, the well log of the deepening of the well shows the presence of cumulative layers of low permeability units totaling 66 feet, potentially reducing the downward movement of contaminants.

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capacity. If the wellhead and surface seal are maintained to standards, as outlined in sanitary surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then contamination from surface events is reduced.

The Clifton well was originally constructed in 1955 to a depth of 202 feet bgs and it was deepened in 2000 to a depth of 352 feet bgs. The static water level can be found at 69 feet bgs. According to the 2000 deepening well log, an eight-inch, 0.322-inch thick casing was placed to 256 feet bgs and the annular seal extends to 110 feet bgs. The casing is perforated from 187 feet bgs to 206 feet bgs, 248 feet bgs to 251 feet bgs, 281 feet bgs to 292 feet bgs, 295 feet bgs to 303 feet bgs, and 314 feet bgs to 344 feet bgs.

The system construction score of the Clifton well was rated moderately susceptible to contamination (Table 3). The 1999 sanitary survey indicates that the wellhead and surface seals are maintained to standards but that the wellhead does not have a well casing vent. The purpose of the vent is to vent the space between the casing and the column and prevent a vacuum from forming when the well turns on and draws down the water table. A vacuum could draw in contamination through joints or leaks in the casing or cause the well to slough. There was insufficient information available to determine the type of soil composition of the placement of the casing and annular seal. However, the well is located outside a 100-year floodplain.

Spring Construction

Spring construction scores are determined by evaluating whether the spring has been constructed according to Idaho Code (IDAPA 58.01.08.04) and if the spring's water is exposed to any potential contaminants from the time it exits the bedrock to when it enters the distribution system. If the spring's intake structure, infiltration gallery, and housing are located and constructed in such a manner as to be permanent and protect it from all potential contaminants, is contained within a fenced area of at least 100 feet in radius, and is protected from all surface water by diversions, berms, etc., then Idaho Code is being met and the score will be lower. If the spring's water comes in contact with the open atmosphere before it enters the distribution system, it receives a higher score. Likewise, if the spring's water is piped directly from the bedrock to the distribution system or is collected in a protected spring box without any contact to potential surface-related contaminants, the score is lower.

The system construction of the spring rated moderately vulnerable to contamination. The spring is located at the canyon floor. According to the 1999 sanitary survey (conducted by DEQ), surface water is piped through the spring area and discharged to the creek. The seven-acre area surrounding the spring is fenced and planted with hay that is regularly mowed. A tile collection system takes water into a concrete spring box. The spring box does not have an overflow. From there, the water flows about 100 feet to another concrete spring box with a four-inch, screened iron overflow pipe. Both boxes have overlapping, locked steel covers. The depth of either of the boxes is unknown. From the lower spring box, water is carried in a 6-inch cast iron pipe approximately one and one-quarter miles to the 100,000-gallon reservoir. Though the spring has a drainage system that collects surface water and pipes it to a point down gradient of the collection area, Clifton Creek is located uphill of the spring. Additionally, cattle have been reported to be grazing in the watershed of the spring, posing a threat of contamination to surface water running into the spring.

Potential Contaminant Source and Land Use

The spring rated moderate for IOCs (i.e., nitrates, arsenic) and low for VOCs (i.e., petroleum products), SOCs (i.e., pesticides), and microbial contaminants (i.e., bacteria). The land use within the area of the spring is classified as rangeland or woodland. The potential contaminant sources existing within the spring delineation are Clifton Creek above the spring and Clifton Creek Road that passes within 1000 feet of the spring area. Additionally, the City of Clifton reported that cattle graze above the spring in the Clifton City watershed, posing a threat of contamination of the spring.

The well rated moderate for IOCs and it rated low for VOCs, SOCs, and microbial contaminants. The predominant irrigated agricultural land and the nitrate priority area within the delineation of the well contributed to the moderate rating for IOCs.

Final Susceptibility Ranking

A detection above a drinking water standard MCL or any detection of a VOC or SOC will automatically give a high susceptibility rating to the spring and/or the well despite the land use of the area, because a pathway for contamination already exists. In 1999 and 2000, total coliform and E. coli bacteria were detected at the spring repeatedly at the spring box, resulting in an automatic high susceptibility score for microbial contaminants. Additionally, potential contaminant sources within 100 feet of a spring and within 50 feet of a wellhead will automatically lead to a high susceptibility rating. In this case, the 1995 GWUDI survey indicates that a farmer's field and a gravel road are located within 50 feet of the Clifton well, resulting in automatic high susceptibility ratings to all potential contaminant categories (Table 3, below). Having multiple potential contaminant sources in the 0- to 3-year time of travel zone (Zone 1B) contribute greatly to the overall ranking.

Table 3. Summary of City of Clifton Susceptibility Evaluation

Drinking Water Source	Susceptibility Scores[1]									
	Hydrologic Sensitivity	Potential Contaminant Inventory and Land Use				System Construction	Final Susceptibility Ranking			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Clifton Spring	--	M	L	L	L	M	M	L	L	H*
Clifton Well	M	M	L	L	L	M	H*	H*	H*	H*

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility,
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
H* = Automatic high score due to farmer's field and a gravel road within 50 feet of the wellhead and a repeat detection of total coliform bacteria at the spring box

Susceptibility Summary

In terms of total susceptibility, the spring rated moderate for IOCs, low for VOCs and SOCs, and high for microbial contaminants due to the repeat bacteria detection at the spring. System construction rated moderate and potential contaminant land use scores were moderate for IOCs and low for VOCs, SOCs, and microbials. The cattle grazing within the watershed above the spring, the gravel road, and Clifton Creek contributed to the susceptibility of the spring to contamination.

The total susceptibility for the Clifton well was high for all potential contaminant categories due to a farmer's field and a gravel road within 50 feet of the wellhead. Hydrologic sensitivity and system construction rated moderate for the well and potential land use scores were moderate for IOCs and low for VOCs, SOCs, and microbials. If the farmer's field and the gravel road are removed or relocated outside the 50-foot sanitary setback, the overall susceptibility of the well would be reduced to moderate for IOCs, SOCs, and VOCs and low for microbial contaminants.

The last detection of total coliform bacteria in the distribution system was recorded in November 2000. However, total coliform bacteria were detected at the spring and repeatedly in the spring box in 1999 and 2000. No SOCs or VOCs have been detected in the water system. The IOCs fluoride and nitrate have been detected in the spring and the well but at concentrations below the MCL for each chemical, as established by the EPA. Additionally, traces of alpha and beta particles (radionuclides) have been detected in the water system.

Section 4. Options for Drinking Water Protection

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed drinking water protection program will incorporate many strategies. For the City of Clifton, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey. The system should continue their efforts to keep the distribution system free of microbial contamination and concentrate on meeting well construction standards such as installing a downturned, screened vent on the wellhead. The City of Clifton may want to install a disinfection system to reduce the chance of bacterial contamination in the water system. Additionally, efforts should be made to work with local landowners and government agencies in protecting the watershed surrounding the spring and the well from contamination associated with activities such as cattle grazing, agricultural chemical use in the field near the well, and accidental spills associated with the corridors near the well and the spring. The hay that is grown in the fenced area around the spring should not have chemicals applied to it within 100 feet of the source. As land uses within most of the source water assessment areas are outside the direct jurisdiction of the City of Clifton, collaboration and partnerships with state and local agencies and industry groups should be established and are critical to success. Educating city employees and the public about source water will further assist the system in its monitoring and protection efforts.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include household hazardous waste disposal methods and the importance of water conservation. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Franklin County Soil Conservation and Water District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (e.g. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the DEQ or the Idaho Rural Water Association.

Assistance

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

Pocatello Regional DEQ Office (208) 236-6160

State DEQ Office (208) 373-0502

Website: http://www.deq.state.id.us

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper (mlharper@idahoruralwater.com), Idaho Rural Water Association, at (208) 343-7001 for assistance with drinking water protection (formerly wellhead protection) strategies.

POTENTIAL CONTAMINANT INVENTORY LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLA – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100-year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25% of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RCRA – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

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Attachment A

City of Clifton

Susceptibility Analysis Worksheets

Susceptibility Analysis Formulas

Formula for Spring Sources
The final spring scores for the susceptibility analysis were determined using the following formulas:

1. VOC/SOC/IOC Final Score = (Potential Contaminant/Land Use x 0.60) + System Construction

2. Microbial Final Score = (Potential Contaminant/Land Use x 1.125) + System Construction

Final Susceptibility Scoring:
0 - 7 Low Susceptibility
8 - 15 Moderate Susceptibility
≥ 16 High Susceptibility

Formula for Well Sources
The final scores for the susceptibility analysis were determined using the following formulas:

1. VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2. Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.375)

Final Susceptibility Scoring:
0 - 5 Low Susceptibility
6 - 12 Moderate Susceptibility
≥ 13 High Susceptibility

Spring Source Susceptibility Report   Public Water System Name : CLIFTON CITY OF   SOURCE : SPRING #1

Public Water System Number 6210002   11/13/02 9:13:01 AM

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; lower score No=water collected after it contacts the atmosphere or unknown; higher score	YES	0
Total System Construction Score		1

3. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	NO	NO	NO	YES
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	0	0
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	3	2	2	3
(Score = # Sources X 2) 8 Points Maximum		6	4	4	6
Sources of Class II or III leacheable contaminants or	YES	3	2	2	
4 Points Maximum		3	2	2	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		9	6	6	6
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	0	0	
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
Land Use Zone II	Less than 25% Agricultural Land	0	0	0	
Potential Contaminant Source / Land Use Score - Zone II		3	0	0	0
Potential Contaminant / Land Use - ZONE III					
Contaminant Source Present	YES	1	0	0	
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		2	0	0	0
Cumulative Potential Contaminant / Land Use Score		14	6	6	6
4. Final Susceptibility Source Score		9	4	4	8
5. Final Well Ranking		Moderate	Low	Low	High

Ground Water Susceptibility Report   Public Water System Name : CLIFTON CITY OF   SOURCE: WELL #1

Public Water System Number 6210002   11/12/02 1:44:44 PM

1. System Construction		SCORE
Drill Date	1955 deepened 2000	
Original Driller Log Available	NO	
Sanitary Survey (if yes, indicate date of last survey)	YES	1999
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	YES	0
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	YES	0
Well located outside the 100 year flood plain	YES	0
Total System Construction Score		3

2. Hydrologic Sensitivity		
Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	YES	1
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	YES	0
Total Hydrologic Score		4

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	YES	YES	YES	YES
Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	Yes	2	1	2	1
(Score = # Sources X 2) 8 Points Maximum		4	2	4	2
Sources of Class II or III leacheable contaminants or	YES	6	1	2	
4 Points Maximum		4	1	2	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Greater Than 50% Non-Irrigated Agricultural	2	2	2	2
Total Potential Contaminant Source / Land Use Score - Zone 1B		12	5	8	4
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Greater Than 50% Non-Irrigated Agricultural	1	1	1	
Potential Contaminant Source / Land Use Score - Zone II		4	4	4	0
Potential Contaminant / Land Use - ZONE III					
Contaminant Source Present	YES	0	1	1	
Sources of Class II or III leacheable contaminants or	YES	0	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		0	2	2	0
Cumulative Potential Contaminant / Land Use Score		21	13	16	8
4. Final Susceptibility Source Score		11	10	10	10
5. Final Well Ranking		High	High	High	High